XXXVII.—*The Sponge-fauna of Norway; a Report on the Rev. A. M. Norman's Collection of Sponges from the Norwegian Coast.* By W. J. Sollas, M.A., F.R.S.E., F.G.S., &c.

[Continued from p. 259.]

[Plate XVII.]

Group *Geodina*, Carter (*continued*).

Genus Isops *, nov. Type *I. Phlegræi*, sp. nov. (*Geodia* auct.)

Diagnosis.—Excurrent and incurrent apertures similar, being the freely open ends of simple cylindrical tubes, which sink directly into the rind of the sponge and end at its inner surface in sphinctral muscles.

Observations.—The ostia of the canal-system are of very various sizes, forming a series in which the largest pass into the smallest by almost insensible gradations. The larger apertures serve as excurrent and the smaller as incurrent ostia.

The simple nature of the ostia and the identity in structure of the incurrent and excurrent ostia and ostial tubes constitute a good distinction between this genus and its allies—*Geodia*, *Cydonium*, and *Pachymatisma*.

The incurrent ostial tubes of *Isops* may be regarded as equivalent to the chones of the preceding genera deprived of their perforate (poriferous) roof.

The excurrent ostial tubes differ from those of *Geodia* in being simple and dispersed, the cribriform area or ostial tube with many sphincters of *Geodia* being possibly due to the integration or coalescence of a number of simple tubes similar to those of *Isops*, thus:—

1 2

1. Ostial tubes of *Isops*, closely congregated.
2. Excurrent tube of *Geodia*, formed by the coalescence of similar ostial tubes.

* ἴσος, equal; ὤψ, an eye (hence a hole).

How far other distinctive characters will be found constantly associated with those given as diagnostic of the genus *Isops*, one cannot at present say. As yet only a single representative of the genus (*I. Phlegræi*) is known to me; between it and *Geodia Barretti*, however, very characteristic differences exist. Thus the former does not possess any of the small acerate spicules, which, projecting erectly from its surface, form the fine superficial down of *G. Barretti*; they appear to be entirely replaced by the large long-shafted spicules which form the externally projecting fascicular ends of the internal spicular fibres. The trifid heads of the long-shafted spicules, moreover, do not, as in *G. Barretti*, apply themselves with horizontally extended rays to the inner surface of the globate layer, but, projecting forwards, penetrate and terminate within the globate layer. At present, however, it is uncertain whether these characteristic differences are generic or specific merely.

Isops Phlegræi *, n. sp.

Sponge more or less spherical, about 1 inch in diameter; surface hispid (when unworn) by the protrusion of long-shafted spicules for about 0·15 inch beyond it; when the spicules are worn away the surface is smooth and of a faint greyish colour. Excurrent and incurrent ostia simple, numerous, scattered. Each ostium a small round or oval opening, situated on the summit of a conical elevation, which is very variable in size, but always minute, the largest measuring 0·125 inch in diameter at the base, and 0·025 inch at the summit; in some cases the elevation may be almost entirely absent, the ostium then lying flush with the general surface of the sponge. Over some parts of the surface small white spots occur, some of which are really and some only apparently imperforate, the latter showing a minute central aperture on magnification. These are the smallest ostia present; between them and those of the largest perforate monticule we have others of every intermediate size.

Skeleton.—The skeleton consists of long-shafted spicules, globates, and stellates.

Thick long-shafted Spicules.—(i) a simple, sharp-pointed, fusiform acerate, 0·24 inch long by 0·0025 inch broad (Pl. XVII. fig. 5); (ii) a trifid spicule with simple, forward-projecting rays, shaft 0·16 inch long, 0·0017 inch broad, rays 0·025 inch long (Pl. XVII. fig. 7); (iii) a trifid spicule, with

* In reference to the ostial elevations of its surface, reminding one of the Campi Phlegræi.

irregular bifurcated rays, shaft 0·13 inch long, rays 0·034 inch long (Pl. XVII. fig. 9).

Slender long-shafted Spicules.—(i) a simple sharp-pointed acerate, 0·0004 inch thick; (ii) a trifid spicule with rays recurved anchor-like, 0·0008 inch thick (Pl. XVII. fig. 6); (iii) a trifid spicule with rays directed forwards, 0·0008 inch thick (Pl. XVII. fig. 8).

Stellates.—(i) a sphæro-stellate with a large body and numerous short conical rays, 0·0005 inch in diameter (Pl. XVII. fig. 12); (ii) a stellate with small body and a few long rays, usually about 0·0008 inch in diameter (Pl. XVII. fig. 13), but often becoming exceptionally large, as much as 0·0015 (Pl. XVII. fig. 10), or rarely even 0·0027 inch in diameter.

Globates.—Oblate and prolate ellipsoids, the latter with one minor axis shorter than the other; covered superficially by erect tubercles, having a more or less flattened polygonal summit, from the corners of which minute short slightly recurved spines are produced. Diameter 0·0036 inch (Pl. XVII. fig. 14).

Locality. Kors Fiord, Station No. 23: 180 fathoms.

Observations.—A section across the sponge shows a thin rind (0·025 inch thick) enclosing a greyish-yellow mark, which is traversed by numerous canals of various sizes. Those large enough to be plainly visible to the naked eye have smooth glistening walls, concentrically striated by fine rugæ: some take a concentric, others a radiate course, the same canal being concentric in one part of its course and radiate at another. The crypts are very irregular in size, some being markedly larger than others; they have lost the characters which distinguish them in *Stelletta Normani*, and appear to be the cut ends of concentric canals, precisely similar to those occurring in the mark, and only differing in being situated immediately beneath the rind; indeed it occurs to one to suggest that both in this instance and in *Geodia Barretti* the concentric canals are merely the cryptal canals left behind in the progressive increase of the sponge.

Histology.

1. *The Cortex.*—The *epidermis* consists of a very distinct transparent, colourless, and apparently structureless cuticle, lying quite separate from the succeeding dermal layer; no nuclei nor cell-borders are observable in it (Pl. XVII. fig. 11, *c*). The *dermal layer* consists of very definite colourless, granular, oval cells, lying quite separate from one another, and forming a layer of variable thickness; sometimes it thins out altogether and lets down the epidermis into immediate contact with the globate layer; sometimes, on the other hand, it thickens out

so as to become three or four cells deep; but usually it consists of a single layer of cells only. Just below the epidermis sphæro-stellates occur between the dermal cells, their rays projecting against the epidermal membrane (Pl. XVII. fig. 11, *d*).

No vesicular nor gelatinous connective tissue is observable in the dermis.

The Globate Layer.—The structure of this does not differ from that described as existing in *Geodia Barretti*, except by the absence of vesicular connective-tissue cells from the triangular spaces left between the fibrillar ligaments; these cells are replaced here, as elsewhere in *Isops Phlegræi*, by gelatinous connective tissue. The most exterior, and therefore oldest, of the globates of the rind are very often hollow within, the small central cavity which exists in the ordinary adult globate having become enlarged to a great but variable extent. This occurs as the result of an absorption which begins at the inner ends of the trichites, and, extending radiately outwards, reproduces the early form of the young globate as a hollow cast within the old one; the same result is brought about by exposing the solid mature globates to the action of boiling caustic potash, as described by me in a previous communication to this Magazine (Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 292).

Subcortical Layer (Pl. XVII. fig. 4).—The purely fibrous part of this (fig. 4, *f*), which lies immediately beneath the globate layer, is very thin, and passes below into gelatinous connective tissue (fig. 4, *c*), in which fibres like those of the fibrous layer lie loose and more or less apart from each other, and being consequently well defined are easily studied *in situ*. They are hyaline and fusiform, with attenuated ends, sometimes greatly prolonged; a central axis is rarely visible; more usually the interior is occupied by an axial cavity; generally it would appear empty, but sometimes contains a small refringent spherule, which I take to be a nucleolus, and is sometimes filled with colourless granular material. The axial cavity may be relatively very small, a mere slit in the centre of the fibre; or it may be large, perforating the whole length of the fibre, and converting it into a genuine tube. The tube so formed is liable to split open at one end; when this happens the slit wall uncurves and spreads out into a thin lamina. The hyaline wall of the fibre frequently also becomes fibrillated and sometimes apparently laminated; it then becomes liable to exfoliation or defibrillation, as the case may be.

The gelatinous connective tissue consists of a colourless, structureless, soft matrix, containing numerous dispersed oval nuclei surrounded by a small quantity of granular colourless

protoplasm, from which in many cases very fine fibrils are prolonged irregularly in various directions. Here and there greyish granular oval cells (Pl. XVII. fig. 16), which have a very distinct outline, and stain deeply with carmine, occur in the matrix. Each one generally occupies a corresponding cavity in the matrix, from which it is completely separated except at one or two points of contact; this separation is probably the result of contraction after placing in spirit. These cells are often pointed at one end, which differs from the rest of the cell in being hyaline and more refringent. The pointed end is sometimes produced into a fine structureless fibre (Pl. XVII. fig. 15).

2. *The Mark.*—The substance of the mark consists of minute granules abundantly dispersed throughout a structureless colourless matrix, forming a greyish tissue, in which small oval nuclei occur at intervals. It stains generally with carmine, but not so deeply as the corresponding tissue of *Stelletta Normani* and *Geodia Barretti*.

It never presents any appearance which might suggest that it consists of a number of separate but closely apposed cells, although, from the remarkably perfect manner in which other delicate histological features of the sponge are preserved, one would expect evident signs of such a constitution if it existed; and as, on the other hand, it is not a mere gelatinous connective tissue like the mark of *Thenea Wallichii* and many other sponges, we may at least provisionally regard it as a genuine syncytium.

3. *The Skeleton. Long-shafted Spicules.*—The long acerates lie longitudinally side by side, forming spicular fibres, which take chiefly a radiate direction from the centre of the sponge towards the rind. On approaching the rind the constituent spicules of each fibre diverge from each other and pass out of the sponge in the form of a fascicle; at the same time trifid spicules put in an appearance, the coarser forms having their heads within, below, and outside the rind, the finer, grapnel-like and slender fork-like forms bearing their heads exclusively outside and at some distance from the rind. In *Geodia Barretti*, it will be recollected, all forms of trifid spicules were exclusively confined to the interior of the sponge, their heads occurring just beneath the rind. The frequent irregularity in the form of the bifurcated ternate spicule of *Isops* is caused by the obstruction of the globates in which it is imbedded, these obstacles hindering its free growth. With each spicular bundle or fibre is associated a tract of tissue very similar to, and, indeed, almost identical with, that of the subcortical layer; it consists of (i) finely granu-

lar cells, which do not differ in general characters from the isolated definite oval cells which have already been mentioned as occurring here and there in the mark and subcortical layer: many of them, indeed, are identical with these in all respects; but most differ in form, becoming much elongated in the direction of the spicular bundle, and thus acquiring a more or less fusiform outline. The nucleus is involved in this change of form, becoming also elongated and fusiform; but the nucleolus is unaffected and retains its spherical form.

These fusiform cells, by becoming gradually hyaline, afford an easy passage into (ii) ordinary hyaline fibres of precisely the same nature as those of the subcortical layer; they lie parallel to the spicules of the spicular bundle, to which they form an enclosure. Sometimes a surrounding band of concentric fibres occurs around the bundle. Finally, (iii) a small quantity of gelatinous connective tissue is in places associated with the spicular bundles.

Where the spicular bundles enter the cortex the fusiform hyaline fibres can be easily followed, diverging from the spicules in a gentle outward curve and entering the subcortical layer, which therefore may be regarded as an extension of the tissue of the spicular tract, modified by increase of growth and change of direction. The change of direction is in accordance with that of the long-shafted spicules, the trifid ends or distal rays of which tend, on reaching the rind, to become more concentric and less radiate in direction. Just below the place where the fibre curves from the spicules to the cortex a number of granular cells, like those described in the same position in *S. Normani*, are often found accumulated.

In addition to a tissue of the bundle there is the tissue of each individual spicule, each being invested in an excessively thin structureless membrane containing small round nuclei surrounded by fine granules and very thin structureless fibrils (Pl. XVII fig. 2, *s*). Now and then one finds isolated hyaline fibres encircling a spicule like a girdle (Pl. XVII. fig. 2, *z*); the meaning of this feature, which is to be found in other related sponges, is not apparent.

Globates.—The structure and development of these spicules can be studied with great facility in this sponge. The earliest form consists of a cell (Pl. XVII. fig. 21, *s*) of the same size as the common, isolated, oval, granular cell of the mark (Pl. XVII. fig. 21, *m*); it contains the little sphere of radiate trichites, which are united together at their inner ends about a small, central, spherical space; externally they terminate in a layer of hyaline sarcode or cell-wall. On one side of the cell is imbedded a round or, more commonly, oval nucleus with its

contained spherical nucleolus. By treating with a 5-per-cent. solution of caustic potash, the cell-wall expands and separates from the contained globates completely (Pl. XVII. fig. 19). With age a hilum is formed, as previously described in the case of *G. Barretti*; but the nucleus merely occupies and does not completely fill the hilum (Pl. XVII. fig. 18), as erroneously stated in the previous description (Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 256). The external ends of the trichites grow much thicker with age, and assume a sharp conical form; the sharp ends of the conical spines then become rounded off and pass into rounded conical tubercles; these finally become flattened and spined round the summit, and the globate is complete. Absorption next ensues. The adult globate always exhibits in section a small central cavity with fine radiate canals proceeding from it; the effect of absorption is to enlarge this cavity and its radiate canals, so that the globate becomes eventually a mere thick-walled shell, its walls being perforated by radiate canals of wide diameter which extend along the axes of the exterior tubercles, and almost but not quite open to the exterior (Pl. XVII. fig. 24).

It appears that the layer of tubercles is liable to separate as a thin shell from the rest of the globate spicule.

Stellates.—The same kind of distribution of the stellates occurs here as in *G. Barretti* and *S. Normani*; none but the sphæro-stellates occur immediately beneath the epidermis; elsewhere the second kind of stellates (Pl. XVII. fig. 13) are chiefly found; the sphæro-stellates occur in the mark immediately beneath the rind, but less abundantly than the other forms. The small-bodied stellates occur lining the interior of the sphinctral canal, in the subcortical layer, and generally through the mark, but especially in the wall of the water-canals.

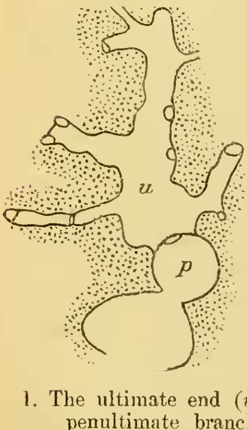
4. *The Water-canal System.*—The characters of the incurrent and excurrent ostial tubes have already been referred to; as they appear to represent the chones of other Corticatæ, it will be convenient to distinguish them as incurrent and excurrent chones. The two kinds of chones differ only in size, both being freely open distally and closed below by a sphincter, which protrudes downwards into a canal which here represents the crypt (Pl. XVII. figs. 1, 3, 20). Thus there is no endochone, and the chones are the equivalents of the ectochone alone.

The incurrent chone leads into a canal which extends parallel to the surface just below the rind for a variable distance, giving off one or more branches, which descend radiately into the interior, and break up into still smaller canals.

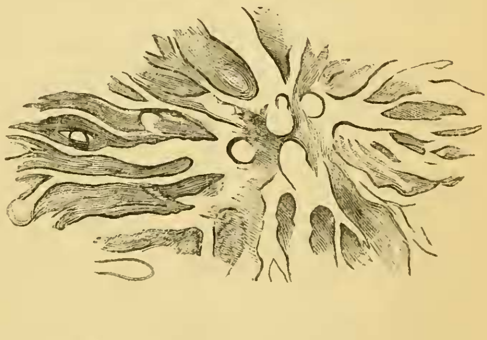
These canals are all exceedingly well defined, and all but the very smallest are provided with a distinct wall, which is transversely ridged by concentric rugæ. Short narrow canaliculi lead from the walls of these incurrent canals, main trunks, branches, and twigs alike, and open abruptly into the surrounding ciliated chambers. At a point generally opposite that at which the incurrent canaliculus enters, the ciliated chamber is gradually produced into an excurrent canaliculus, which is somewhat wider and less well defined than the corresponding incurrent vessel. The excurrent canaliculi join gradually together to form a trabecular tube, which, joining with others of a similar character, at length lead into a large canal with very definite and transversely rugate walls. This canal finally opens into an excurrent chone through a sphincter, and so communicates with the exterior.

There is a great difference in the way in which the ultimate canals of the excurrent and incurrent tubes are connected with the larger canals: in the former, as previously mentioned, the junction is gradual, the ultimate canals enlarging a little towards the point of junction, and then flowing together at an acute angle; in the latter the ultimate branches are given off abruptly and, remaining of about the same diameter, end abruptly; they also make rather a right than an acute angle with the larger branches. The figures of the annexed woodcut show the difference in character of the ultimate canals of the two systems very plainly.

1



2



1. The ultimate end (*u*) of an *incurrent* canal, proceeding from the penultimate branch (*p*), which is vesicular and provided with diaphragms to the end (× 70).
2. The ultimate ends of an excurrent tube gathering to form a penultimate trabecular tube, which has been cut across transversely.

The Chones (Pl. XVII. figs. 1, 3).—These, as well as the whole of the canal-system, with the exception of the ciliated chambers, are lined by a delicate epithelial layer.

Their walls are chiefly composed of concentrically arranged fusiform fibres, very similar to muscle-fibre, but staining much less intensely with carmine. Near the lower end of the chone this layer becomes continuous with the thick conical muscle which "plugs" the bottom of the chone and protrudes its apex into the subjacent crypt. The mass of the muscle consists of true, fusiform, muscular fibres concentrically arranged around a central canal, which is lined by epithelium and associated sharp-rayed stellates. The subcortical layer, where it joins the muscle, frequently dovetails with it, thrusting a small wedge of gelatinous connective tissue (*c*) into its side and receiving on its lower face a short superficial extension of the muscle-fibres, while its upper strictly fibrous portion (*f*) passes gradually into the muscle, the muscle having very much the appearance of being an over-development of the subcortical fibrous layer: this appearance is probably very near the truth, both structures having most likely been derived from a primitively indifferent fibrous layer, which on the one hand became modified into connective and on the other into muscular fibres. The chones are clearly the modified outermost vesicles of their associated canals, and their sphincters the modified rugæ of these canals. Hence the canal-walls contribute a share to the formation of the fibrous layer of the cortex.

The Canals.—The ultimate ramifications of the canal-system, as well as the smaller trunks into which they collect, are simple excavations in the mark lined by epithelium, which gives them, especially those having an incurrent function, a very sharp and definite outline. In the case of the larger canals the mark immediately surrounding them becomes a little less granular than elsewhere, and stains a little less deeply with carmine; hyaline fusiform fibres and sometimes granular fusiform cells appear in it, sometimes lying separate from each other, sometimes accumulated side by side and with overlapping ends forming a fibrous band. They are arranged both longitudinally and transversely with respect to the axis of the canal; but in the trabecular excurrent canals their position is governed by that of the trabeculæ, which they traverse more or less longitudinally. The structure of a canal-wall when fully developed exhibits, in transverse section, first, on the inside, a layer of epithelium, next a layer as much as 0·00125 inch thick of fibrous tissue, and then a layer of gelatinous connective tissue adjoining the mark.

The canals, especially the incurrent ones, are ridged transversely by circular rugæ, which are simply thin lamellar extensions of the wall, composed of epithelium and a small quantity of a tissue containing numerous very fine fibrillæ, which are arranged concentrically in each ruga and are slightly more abundant along its edge than elsewhere. The rugæ are often so greatly developed as to form iris-like diaphragms extending almost halfway across the canal; and as the canal is also constricted around the origin of the diaphragm, it thus becomes divided into a series of bladder-like compartments. This vesicular character occurs in many other sponges, but in none so markedly as in *Thenea Wallichii*, which will be described subsequently. In *Isops* the vesicular character is most pronounced in the incurrent tubes, if not confined to them, and the rugæ or diaphragms likewise are chiefly characteristic of these tubes, occurring in all, from the largest down to those having a diameter of only $\frac{1}{200}$ inch or less; in the excurrent tubes they are never so numerous nor extended so far across the canal, nor do they occur in tubes of such small diameter as in the incurrent system; it appears to me that they never occur in excurrent tubes unless of considerably over $\frac{1}{100}$ inch diameter.

The physiological explanation of this difference in structure between the excurrent and incurrent tubes appears to lie in the fact that the water expelled into the former is under a slight excess of pressure, which is sufficient to keep them widely open; it is propelled by a *vis a tergo*. The water in the incurrent tubes, on the contrary, is drawn through them by a *vis a fronte*, and is thus under a slightly diminished pressure; they would therefore tend to be compressed by the water in the surrounding tissues; and it is possibly to prevent this that their walls are strengthened by the concentric rugæ.

Ciliated Chambers (Pl. XVII. fig. 23).—These organs are almost spherical in form and 0·001 inch in diameter; they consist of a structureless membrane, covered on the inner surface by roundish nuclei, surrounded by granular protoplasm, and disposed at very regular distances apart. Cilia proceed from these nucleated patches, radiating from the walls towards the centre of the chamber. They thus clearly represent, as far as they could be preserved, the collared cells of other sponges.

As previously mentioned, the ciliated chambers everywhere surround in close proximity the walls of the whole of the incurrent canals, large and small alike (Pl. XVII. fig. 27). Short narrow canals, usually about 0·0006 to 0·0009 inch long and 0·00025 inch in diameter, open abruptly into them and connect

them with the incurrent system. On the other hand they are gradually prolonged into the small ultimate canals of the excurrent system (Pl. XVII. fig. 25); they are the expanded ends of these canals, which unite together into larger trabecular tubes, having no direct communication with ciliated chambers, except that furnished by these tributary ultimate canals.

Herein lies the great distinction between the incurrent and excurrent system. The tubes of the former communicate directly at every part of their course with ciliated chambers; the tubes of the latter only communicate with the chambers at the end of their ultimate ramifications, just as a tree only bears leaves at the end of its twigs.

This observation, in connection with the difference in the mode of connexion (first pointed out by F. E. Schulze) of the excurrent and incurrent canaliculi with the ciliated chambers, is very suggestive. The cells of the ciliated chambers, together with the epithelial lining of the excurrent canals, are the adult representatives of the endoderm of the larval sponge; the epithelium of the incurrent tubes, together with the epidermis, are the descendants of the original ectoderm. In course of growth the ectoderm and endoderm have increased more rapidly than the intermediate tissue, which F. E. Schulze terms mesoderm; and the result has been an involution in two opposite directions—the endoderm developing like a racemose gland in one direction, the ectoderm undergoing a simpler involution in the other; such, at all events, appears to me the origin of the canal-system in *Isops* and *Geodia*.

Our observations might, however, be brought into accordance with Häckel's theory of the canal-system, if we consented to regard our incurrent canals as forming an intervascular system, and the excurrent only as a genuine gastrovascular system. At the same time this is a purely theoretical view; and I cannot see how one reasonable man can blame another for choosing to consider the canal-system of such a sponge as *Isops* or *Geodia* as having a so-called "bipolar" arrangement, which, as a matter of observation, independent of all theory, it *has*. In saying this I am far from expressing any difference of opinion from Häckel, whose general conclusions are clearly in the main correct, but simply desirous of adding my testimony to the value of Carter's observations, which are always faithful and accurate, and worthy a more generous estimate than that awarded them by his opponent.

While speaking of the canal system I would take the opportunity to point out the fact that the vesicular character of the incurrent canals is of a totally different nature from that described by Häckel as distinguishing his "blasenförmige"

type of "Astcanäle" in the Leucones, and conjectured by him to exist also in the rind-sponges; one has but to compare the description given of this structure in the Leucones ('Die Kalkschwämme,' p. 235) with that given here as regards *Isops*, to see that there is no real resemblance between them.

Pathology.

The exterior of the sponge is covered by various attached foreign bodies, such as young sponges, both calcareous and siliceous, minute Hydrozoa, Algæ, and Foraminifera. A small *Waldheimia* is also rooted into the sponge at one point, without apparently causing much harm. The larger attached Foraminifera are covered marginally by a thin brownish film, which has extended onto their upper surface from the dermis of the sponge. At its extreme edge this film only contains stellate spicules; but further on a few globates make their appearance. It would appear that the sponge is making, in these cases, an effort to overgrow and enclose the foreign bodies. On touching one of the Foraminifera with a sharp-pointed instrument, however, it separates from the sponge with the greatest facility, bearing with it on its under surface a number of attached globates, and leaving behind an irregular pit in the cortex. If the removed globates, or those immediately surrounding the pit left in the rind, be examined under the microscope, it will be found that they have entirely lost their fibrillar connective ligaments, which have degenerated into a quantity of granular material, probably of the nature of pus.

In the interior of the sponge foreign bodies also frequently occur—diatoms, Radiolaria, foreign sponge-spicules, Foraminifera (both calcareous and arenaceous), and the fibres of the *Waldheimia*-peduncle.

The siliceous inclusions and the fibres of the Brachiopod are simply imbedded in the mark, without producing or suffering any apparent change; the calcareous Foraminifera, however, lose the calcareous walls of their test by absorption, some kind of hyaline material taking their place; at the same time the mark surrounding the tests and filling their chambers becomes converted into gelatinous connective tissue.

Turning, again, to the foreign bodies of the exterior, one very singular case of commensalism remains to be noticed. A small Geodine sponge, only just escaped from the larval stage, has attached itself immediately over one of the incurrent chones (Pl. XVII. fig. 1, *p*), and grown in such a manner that the terminal opening of its single branched excurrent tube is

exactly applied to the ostium of the incurrent chone of the *Isops*; and thus the supply of food and water brought to this particular chone can only reach it after straining through the intercepting parasite.

Should the association, which we may here regard as accidental, become permanent, great structural changes would probably be produced in the parasite: for one thing, the collared cells would be relieved of the necessity of propelling water through the organism, and could restrict themselves to gathering food for it; and no doubt this would lead to various other modifications. That in certain cases the association does become persistent is quite certain; for in a large specimen of *Ectyon sparsus* contained in the Bristol Museum we find a large number of the oscules lined each by a small parasitic *Geodia* belonging to an undescribed species; but as this specimen is unfortunately not preserved in spirits, we cannot determine the kind of histological change which may have been induced in it.

EXPLANATION OF PLATE XVII.

Isops Phlegræi (n. gen. et sp.).

Fig. 1. Section across the rind, showing an excurrent chone (E) and an incurrent chone with a young Geodine sponge (*p*) grown over its mouth: *f*, subcortical fibrous layer; *c*, gelatinous connective tissue (× 15).

Fig. 2. A long-shafted spicule enveloped in the spicule-sheath, *s*, and encircled by single, fusiform, hyaline fibres, *z* (× 140).

Fig. 3. Transverse section of the rind, showing incurrent chone with its sphincter protruding into the subjacent crypt (× 15). Canada-balsam preparation.

Fig. 4. Transverse section of lower part of rind: *g*, lowest-lying globates of globate layer; *f*, fibrous layer; *c*, gelatinous connective tissue with scattered fusiform fibres and an oval granular cell; *r*, rugæ of cryptal canal (× 70).

Fig. 5. Fusiform acerate spicule (× 15).

Fig. 6. Head of slender ternate spicule with recurved rays (× 60).

Fig. 7. Trifid spicule (× 15).

Fig. 8. Head of slender porrecto-ternate spicule, with only one ray developed (× 60).

Fig. 9. Bifurcated trifid spicule (× 15).

Fig. 10. Large stellate from the mark (× 435).

Fig. 11. Section across the dermal layer: *e*, epidermis; *d*, dermis, with intercalated stellates; *g*, outermost globates of the globate layer (× 217).

Fig. 12. Sphæro-stellate of the rind (× 435).

Fig. 13. Stellate of the mark, usual size (× 435).

Fig. 14. Outline of globate (× 60).

Fig. 15. A granular cell with terminal filament; from the gelatinous connective tissue of the subcortical layer (× 435).

Fig. 16. Similar to fig. 15, but without the extended filament (× 435).

Fig. 17. A fusiform hyaline fibre, showing a central cavity (nucleus) with a small spherule (nucleolus) (× 435).

Fig. 18. The hilum of a globate, with its contained nucleus. The nucleus exhibits a distinctly double contour, fluid contents, and a spherical nucleolus (× 435).

Fig. 19. A globate cell after treatment with dilute potash (5 per cent.), showing separated cell-wall and contained nucleus (× 435).

Fig. 20. Transverse section across rind and subjacent mark, showing an incurrent chone opening by a sphincter protruding into a rugose incurrent canal (*i*), and the smallest branches of the excurrent canal (*e*) terminating close to its walls (× $7\frac{1}{2}$).

Fig. 21. A fragment of mark containing a granular mark-cell (*m*) and a globate cell (*s*) (× 435).

Fig. 22. The smallest or earliest stage of globate yet observed (× 435).

Fig. 23. A ciliated chamber (× 435).

Fig. 24. The tubercular surface of a globate, seen face on, showing the large axial canals perforating the tubercles (× 435).

Fig. 25. Longitudinal section of the terminal branch of an excurrent canal (*e*) with its canaliculi ending in ciliated chambers: *i*, the ultimate branch of an incurrent canal supplying the ciliated chambers (× 157).

Fig. 26. An iris-like diaphragm from one of the rugose incurrent tubes, seen face on (× 60).

Fig. 27. Transverse section of an incurrent tube, from which canaliculi proceed and enter the ciliated chambers (× 204).

[To be continued.

XXXVIII.—*New Genera and Species of Coleoptera from Madagascar.* By Charles O. Waterhouse.

A collection of Coleoptera recently received at the British Museum from Madagascar has brought to light several new species, which I here describe, with some also which were received from former collections.

Cetoniidæ.

Parachilia compacta, n. sp.

Nigra, opaca; elytris obsolete punctatis, marginibus obscure piceis; pedibus nitidis. ♂, ♀.

Long. 13 lin.

Very close to *P. bufo*, G. & P., but differs in being considerably shorter, less narrowed posteriorly, and with the elytra apparently constantly margined with purple-pitchy colour. The legs are shorter, and the difference in the length of the tarsi is very great in the male; in *P. bufo* the posterior tarsi are longer than the tibiæ by the two apical joints, whereas in *P. compacta* the tarsus is only about half the apical joint longer